

## **HEAD LICE - *Pediculosis capitis***

In the U.S., there are between 6 to 12 million cases each year, most commonly among children three to 12 years of age. Head lice are not a sign of uncleanliness and do not vector disease organisms. The most common symptoms are itching and sleeplessness. Scratching can lead to secondary bacterial skin infection. Head lice cases can result in extreme anxiety, embarrassment, unnecessary days lost from school and pesticide exposure. Millions of dollars are spent on remedies annually.

The adult louse is 2 to 3 mm long (the size of a sesame seed); color varies. The female lives for 3 to 4 weeks and lays approximately 10 eggs (nits) a day. The eggs are firmly attached to the hair shaft close to the scalp. Viable nits are camouflaged with pigment to match the hair color of the infested person. They are most easily seen at the hairline at the back of the neck. Empty egg casings are easier to see, appearing white against the hair.

Eggs are incubated by body heat and hatch in 10 to 14 days. After hatch, nymphs leave the shell casing grow for about 9 to twelve days before reaching the adult stage. If left untreated, the life cycle may repeat every 3 weeks.

Lice feed by injecting small amounts of saliva and removing tiny amounts of blood from the scalp every few hours. The saliva may create an itchy irritation. A first case of head lice may not result in itching for four to six weeks. Once sensitized, subsequent infestations cause itching almost immediately.

Head lice usually survive for less than two days if away from the scalp at normal room temperature. Eggs cannot hatch at an ambient temperature lower than that near the scalp. Laundering and drying clothing and bedding at 130°F will kill all stages.

### **Screening for head lice**

Screening for head lice in schools is a very useful role for the school nurse. Active infestations need to be addressed individually.

An adult louse can crawl six to 30 cm. per minute. They are hard to see and very difficult to remove. Nits are easier to spot, especially at the nape of the neck or behind the ears. Unhatched eggs will be within 1 cm of the scalp. In general, nits found more than 1 cm from the scalp are unlikely to be viable, but in warmer climates viable nits can occur farther from the scalp.

Screening for nits is not an accurate way of predicting which children will become infested. Only approximately 18% of kids with nits alone, will convert to an active infestation (Williams LK, Reichert A, MacKenzie WR, Hightower AW, Blake PA. Lice, nits, and school policy. *Pediatrics*. 2001;107:1011–1015).

Children having 5 nits or more within 1 cm<sup>2</sup> of the scalp are significantly more likely to develop an infestation, still only 1/3 of these higher-risk children convert. Generally, around 30% of school children with nits will have concomitant lice.

The presence of adult lice in a child's head is the only definitive indication of an infestation that should trigger a head treatment. Other members of the family should inspect each other along with children who regularly sleep-over or share hair apparel (hair clips, head-sets, hats, etc.).

### **Should classroom or school-wide screening be discouraged?**

Having children assessed by the school nurse has many benefits beyond finding head lice. Providing information to families on the diagnosis, treatment, and prevention of head lice is a great plan. Parents and the school nurses should be encouraged to recheck their student's head for lice after treatments have occurred, if the child is still symptomatic.

If an active infestation is noted, the child's parent or guardian should be notified immediately. Treatment options may be suggested.

The American Academy of Pediatrics and the National Association of School Nurses ([www.nasn.org/positions/nitfree.htm](http://www.nasn.org/positions/nitfree.htm)) discourage "no nit" policies in schools. There is no need to send students home.

### **Non-chemical management for head lice**

#### **Manual removal of nits**

None of the pediculicides are 100% ovicidal so removal of nits close to the head is always recommended. Fine-toothed "nit combs" are helpful. The Neon nits (Clear Lice Systems) product is designed to turn nits pink for easier sighting.

**Combing and brushing wet hair damages lice and eggs significantly. Additionally, use of a hair dryer further injures adults, nymphs and nits.**

#### **Step-by-step**

- 1) Comb and divide hair into sections, use a metal fine toothed louse comb to remove nits and lice. After combing each section dip the comb in a container of hot soapy water to remove lice and nits.
- 2) Repeat if nits are still attached within 1 cm of the scalp.
- 3) Repeat until all the sections of hair have been systematically combed.
- 4) Clean nit removal comb, clips, brushes, headphones, hats, etc. with hot soapy water.

Lice treatment kits often include nit removal aids. These are often lotions or sprays that are designed to help loosen the attachment of the egg on the hair shaft. Unfortunately, there is no independent scientific data indicating a benefit.

Nit removal aids are designed to loosen the attachment of the nit to the hair shaft. Vinegar or vinegar-based products (e.g. Clear Lice Egg Remover Gel) are applied to the hair for 3 minutes before combing out the nits. No clinical benefit has been demonstrated.

### Occlusive Agents

A "petrolatum shampoo" consisting of 30 to 40 g of standard petroleum jelly massaged on the entire surface of the hair and scalp and left on overnight with a shower cap has been suggested. Diligent shampooing is usually necessary for at least the next 7 to 10 days to remove the residue.

Other occlusive substances have been suggested (mayonnaise, tub margarine, herbal oils, olive oil), but we have not had good results. Unfortunately, no clinical benefit has been demonstrated from any of the occlusive treatments.

### Pediculicide options for head lice

Most treatments for lice are shampoos left on the head for no more than 10 minutes. Most will not kill eggs so a second treatment is suggested. Removing nits close to the head is usually included in the treatment instructions. Most products warn against using the products on broken skin. However, the related itching that occurs usually leads to excoriation of the scalp, which may be severe.

If repeated treatments fail, some physicians will prescribe higher levels of permethrin (5%), or resort to scabies treatments (e.g. Crotamiton, Sulfamethoxazole, Trimethoprim, Ivermectin, etc.), and these are **extremely** hazardous to children.

Table Commonly used nit removal aids

a. label formulations.

Active ingredient	Example Products and EPA Registration Number	Uses
Jojoba Oil <i>Simmondsia chinensis</i> Lavender Oil <i>Lavandula officinalis</i> Orange Blossom Oil Peppermint Oil <i>Mentha piperita</i> Lemongrass Oil <i>Cymbopogon citratus</i> Rosemary Oil <i>Rosmarinum</i>	Head Lice Solution	Treatment with no nit-picking stage required. Repeat treatments recommended.

<i>officinalis</i> Soybean Oil, Soy Methyl Esters Mineral Oil		
<i>Rosmarinus officinalis</i> , olive oil, d-limonene, neem oil. <i>Eucalyptus globulus</i> , olive oil, d-limonene, neem oil.	LiceX™	Homeopathic shampoo product that kills lice and nits on contact. The herbs, botanicals, and essential oils suffocate lice in half an hour. Followed by repellent spray.
Enzyme based mousse shampoo (purified water, anionic/nonionic surfactant blend, glycerin, enzymes, peppermint oil, sodium borate.)	Not Nice to Lice, Lice R Gone®	Wet hair with warm water. Massage shampoo into the hair, scalp, and nape of neck for ~ 5-10 minutes. Add shampoo + warm water as necessary until a foaming lather is formed. Avoid contact with the eyes. If contact occurs, flush eyes with water. Rinse hair thoroughly with warm water. Follow with Tangles R Gone® hair conditioner to ease removal of nits with a comb and to enhance prevention of reinfestation. Repeat as needed.
Comb	LiceMeister® Comb, Nit Free Terminator Comb, Ace Comb, etc.	Fine tooth combs.
Sodium Chloride (Natrium muriaticum).	Licefreee	The thick, clear gel is applied to dry hair. The head is capped. The formula is also safe for multiple applications.

Electronic comb	LiceGuard, Robi-Comb Electronic Head Lice Detector and Remover	Use only on dry hair. The comb electrocutes the lice. On contact. The Comb operates on a single AA (1.5v) battery. When switched ON, the comb emits a buzzing sound. When the buzzing stops during combing, it means lice are trapped in the comb's tooth section. Check the comb for lice. Clean the teeth with the small brush provided and the buzzing noise returns.
Nit indicator	Neon Nits, Lice Egg, Nit Locator Hair Treatment Spray	Neon Nits, a Lice Egg, Nits, Locator Spray, that makes nits easy to see to comb out of hair. Non-Toxic spray that makes Nits glow so you can see them and comb them all out. It leaves nits colored with a fluorescent dye formula.

Table Commonly used Pediculicide products for head lice

a. CAUTION label formulations.

Active ingredient	Example Products and EPA Registration Number	Uses
Anise oil, coconut oil, and ylang ylang oil in an isopropyl alcohol carrier.	Hair-Clean-1-2-3®	Over the counter botanical reported to have a similar level of efficacy to Nix®. It has a very strong licorice smell, and it should be used with caution because of the high alcohol content making it highly flammable. The product is sprayed onto dry hair and left for 15 minutes. Then, lice and nits are removed with a metal nit comb (which comes with the product). A second application is suggested 7-10 days after the first. This product is most likely to be found in health food stores.

<p>Cetaphil® Cleanser (Water, Cetyl Alcohol, Propylene Glycol, Sodium Lauryl Sulfate, Stearyl Alcohol, Methylparaben, Propylparaben, Butylparaben.)</p>	<p>Nuvo®</p>	<p>Apply the wet lotion throughout the scalp. Comb out as much excess lotion as possible. Use a blow dryer to dry your child's hair. This dries the lotion on the scalp, and coats any lice in a shrink-wrap-like layer. The dry lotion must remain on the hair and scalp for at least 8 hours. Usually parents leave it in place until the child's usual bath or shower the next day. The course of treatment consists of 3 applications done at one week intervals.</p>
<p>Permethrin (1%)</p>	<p>Nix®</p>	<p>Over the counter head louse treatment kits, including nit comb, etc. Currently the recommended treatment of choice by pediatricians. It has a lower mammalian toxicity than pyrethrins and does not cause allergic reactions in individuals with plant allergies. The product is a cream rinse applied to hair that is first shampooed with a non-conditioning shampoo, and then towel dried. It is left on for 10 minutes and then rinsed off, and it leaves a residue on the hair that is designed to kill nymphs emerging. 20% to 30% of eggs are not killed with the first application. It is suggested that the application be repeated if live lice are seen 7 to 10 days later.</p>

<p>Pyrethrins plus piperonyl butoxide</p>	<p>RID®, A-200®, Pronto®, Available in kits, e.g. Clear lice System®, LiceGuard, etc.</p>	<p>Over the counter head louse treatment kits, including nit comb, etc. Natural extracts from the chrysanthemum. Mostly shampoos that are applied to dry hair and left on for 10 minutes before rinsing out, over a sink rather than in the shower to limit exposure, and with cool rather than hot water to minimize absorption. Neurotoxic to lice. Not ovicidal (newly laid eggs do not have a nervous system for several days); 20% to 30% of the eggs remain viable after treatment. A second treatment is suggested after 7 to 10 days. Possible allergic reaction in patients who are sensitive to ragweed, or chrysanthemums</p>
<p>Pyrethrum Extract, Piperonyl Butoxide. Enzymes Including the Following:, Oxidoreductase, Transferase, Lyase, Hydrolase, Isomerase, Ligase, Hydroxyethylcellulose, Sodium Benzoate</p>	<p>Clear Total Lice Elimination System</p>	<p>Shampoo dry hair. Allow product to remain on area for 10 minutes. Rinse thoroughly. After rinsing, use Lice Egg Remover and special nit comb to remove dead lice or nits. A second lice treatment is recommended after 7-10 days. Follow treatment with lice egg remover (comb and enzyme gel): Apply clear enzyme gel to wet hair at scalp. Thoroughly cover entire scalp area and lightly massage. Wait 3 minutes before combing. Use Clear nit capturing comb to remove eggs. Check daily for next 7-10 days to detect any overlooked eggs. If lice eggs are found, repeat use of Clear lice egg remover comb and enzyme gel system.</p>

Notice: The Nuvo method for treating and diagnosing head lice has not been evaluated or approved by the U.S. Food and Drug Administration.

b. WARNING label formulations with greater risk potential.

Active ingredient	Example Products and EPA Registration Number	Uses
Lindane (1%)	Kwell®	Prescription only organochloride that has central nervous system toxicity in humans; several cases of severe seizures in children using lindane have been reported. The shampoo should be left on for no more than 10 minutes, a repeat application is suggested after 7 to 10 days. It has low ovicidal activity (30% to 50% of eggs are not killed).
Malathion (0.5%)	Ovide®	Prescription only organophosphate (cholinesterase inhibitor) lotion that is applied to the hair, left to air dry, then washed off after 8 to 12 hours. Malathion has a high ovicidal activity, but the product directions suggest reapplication if live lice are seen in 7 to 10 days. The product has a high alcohol content, making it highly flammable, and there is an associated risk of severe respiratory depression.

**Emerging issues, new strategies and priorities for head lice**

Resistance has been reported to lindane, pyrethrins, and permethrin. None of the currently available pediculicides are adequately effective against the egg stage.

Table Priorities for head lice.

Research Efficacy of botanical pesticide products, enzymatic, and occlusive agents, and other novel reduced-risk options on head lice.
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The threshold for pesticidal treatment should be the presence of nymphs and adults, or a specified number of nits per cm<sup>2</sup> of scalp.

#### Education

Support materials for schools offering reduced-risk treatment advice.

Effective head lice screening guidance, i.e. an emphasis should be placed on screen for nymph and adult head lice, not just nits. The threshold for pesticidal treatment should be the presence of nymphs and adults, or a specified number of nits per cm<sup>2</sup> of scalp.

#### Regulatory

Lindane is significantly more hazardous, and significantly less effective than the over the counter alternatives. In 2003, the Food and Drug Administration (FDA) issued a Public Health Advisory concerning the use of topical formulations of Lindane Lotion and Lindane Shampoo for the treatment of scabies and lice.

The boxed warning states that Lindane Lotion and Lindane Shampoo are to be used with caution in patients who weigh less than approximately 110 pounds (50 kilograms).

<http://www.fda.gov/bbs/topics/ANSWERS/2003/ANS01205.html>

#### Management

Sound response strategies: stop all “no-nit” policies, pesticidal treatments of school environments (classrooms, dormitories, busses, etc.).

### **Additional resources for head lice management**

The American Academy of Pediatrics and the National Association of School Nurses ([www.nasn.org/positions/nitfree.htm](http://www.nasn.org/positions/nitfree.htm)).

Frankowski, B.L., and L.B. Weiner. 2002. Head Lice. *Pediatrics* Vol. 110(3): 638-643.